AMENDMENTS TO THE CLAIMS

1. (Withdrawn) A magnetic sensor comprising:

a Z-axis sensor constituted of a plurality of giant magnetoresistive elements, which include magneto-sensitive elements formed on slopes of channels, which are formed in parallel with each other by processing a thick film formed on a semiconductor substrate, and bias magnets for electrically connecting the magneto-sensitive elements in series; and

an X-axis sensor and a Y-axis sensor constituted of a plurality of giant magnetoresistive elements formed at prescribed positions on a planar surface of the thick film.

2. (Original) A manufacturing method for a magnetic sensor comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

forming a passivation film on the planation layer;

forming a thick film on the passivation film;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1, thus forming a plurality of channels in the thick film;

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming magneto-sensitive elements forming the giant magnetoresistive elements on the planar surface of the thick film and the slopes of the channels; and

forming a protection film.

3. (Currently Amended) A [[The]] manufacturing method for a magnetic sensor ~~according to claim 2 further~~ comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

removing a part of the planation layer so as to make a via and a pad be exposed;

forming a passivation film on the planation layer;

removing an upper layer of the passivation film from the via and the pad;

forming a thick film on the passivation film;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1, thus forming a plurality of channels in the thick film;

~~after etching of the resist film,~~ removing the thick film and a lower layer of the passivation film from a center of the via, thus making a conductive portion of the via be exposed;

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

~~after formation of the bias magnets,~~ forming a wiring film connecting the bias magnets and the conductive portion of the via;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming magneto-sensitive elements forming the giant magnetoresistive elements on the planar surface of the thick film and the slopes of the channels;

forming a protection film; and

~~after formation of the protection film,~~ removing the thick film and the lower layer of the passivation film covering the pad, thus making a conductive portion of the pad be exposed.

4. (Withdrawn) The manufacturing method for a magnetic sensor according to claim 2, wherein the plurality of channels are formed by pressing a mold having a plurality of projections matching the plurality of channels formed in the thick film toward the resist film after formation of the resist film.

5. (Currently Amended) A [[The]] manufacturing method for a magnetic sensor ~~according to claim 2,~~ comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

forming a passivation film on the planation layer;

forming a thick film on the passivation film;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1, thus forming a plurality of channels in the thick film;

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming magneto-sensitive elements forming the giant magnetoresistive elements on the planar surface of the thick film and the slopes of the channels; and

forming a protection film,

wherein after formation of the resist film, a photomask having fine patterns, the number of which per unit area gradually increases from a center to both ends of at least one of the channel formed in the thick film, is positioned opposite to the resist film, which is then subjected to exposure and development, thus forming the at least one channel in the resist film.

6. (Withdrawn) The manufacturing method for a magnetic sensor according to claim 2, wherein after the heat treatment of the resist film, a reactive ion etching method is performed on the resist film and the thick film under high ion etching conditions, thus forming the plurality of channels in the thick film.

7. (Currently Amended) A manufacturing method for a magnetic sensor ~~according to claim 2 further~~ comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

forming a passivation film on the planation layer;

forming a thick film on the passivation film;

forming an insulating film by depositing silicon oxide on the thick film by way of a high-density plasma CVD method, thus forming a plurality of projections having linear ridgelines in a part of the insulating film; [[and]]

etching the insulating film having the plurality of projections and the thick film under high ion etching conditions, thus forming [[the]] a plurality of channels in the thick film and also reducing the thickness of the thick film remaining on [[the]] a via and [[the]] a pad;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1;

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming magneto-sensitive elements forming the giant magnetoresistive elements on the planar surface of the thick film and the slopes of the channels; and

forming a protection film.

8. (Withdrawn) A magnetic sensor according to claim 1, wherein an etching stopper film is formed between the thick film and the semiconductor substrate.

9. (Original) A [[The]] manufacturing method for a magnetic sensor ~~according to claim 2,~~ comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

forming a passivation film on the planation layer;

forming a thick film on the passivation film;

forming ~~wherein~~ an insulating film ~~is formed~~ between the thick film and the passivation film;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1, thus forming a plurality of channels in the thick film, wherein the insulating film [[and]] is used as an etching stopper to perform the etching;

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming magneto-sensitive elements forming the giant magnetoresistive elements on the planar surface of the thick film and the slopes of the channels; and

forming a protection film.

10. (Withdrawn) A magnetic sensor according to claim 1, wherein each of the channels is constituted by a first slope on an upper side and a second slope on a lower side, and wherein an inclination angle of the second slope is larger than an inclination angle of the first slope, and the magneto-sensitive element is formed on the second slope.

11. (Original) A [[The]] manufacturing method for a magnetic sensor ~~according to claim 2,~~ comprising the steps of:

forming a planation layer that provides planation by covering a wiring layer of a semiconductor substrate;

forming a passivation film on the planation layer;

forming a thick film on the passivation film;

forming a resist film on the thick film;

partially removing the resist film;

performing heat treatment on the resist film, thus making terminal surfaces thereof incline;

performing etching on the resist film and the thick film at an etching selection ratio of 1:1, thus forming a plurality of channels in the thick film, wherein each of the slopes of the channels formed by the etching is constituted of a first slope on an upper side and a second slope on a lower side, and wherein an inclination angle of the second slope is larger than an inclination angle of the first slope[[,]];

forming bias magnets forming giant magnetoresistive elements on a planar surface of the thick film as well as slopes, top portions, and bottoms of the channels;

forming a giant magnetoresistive element film;

positioning the semiconductor substrate, in which the giant magnetoresistive film is formed, close to a magnet array, and subjecting the semiconductor substrate to heat treatment;

removing a part of the giant magnetoresistive element film by way of etching, thus forming ~~and the~~ magneto-sensitive ~~element is formed~~ elements forming the giant magnetoresistive elements on the planar surface of the thick film on the second slope of the channels; and

forming a protection film.

12. (Withdrawn) A magnetic sensor according to claim 1, wherein a dummy slope is formed with respect to at least one of the plurality of channels, so that none of the giant magnetoresistive elements are formed on the dummy slope.

13. (Withdrawn) A magnetic sensor according to claim 1, wherein a second dummy slope is formed in proximity to ends of the plurality of channels in the longitudinal direction.

14. (Withdrawn) A magnetic sensor according to claim 1, wherein ends of the plurality of channels in the longitudinal direction are rounded.